

Transradial Amputation with Nerve Management: Case Presentation and Surgical Technique

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Background

When feasible, transradial amputation is often selected to facilitate pronation and supination and improve prosthetic control. Nerve and soft tissue management are vital for optimizing outcomes following amputation. Targeted Muscle Reinnervation (TMR) and Regenerative Peripheral Nerve Interface (RPNI) are surgical techniques used to treat nerve and neuroma pain and enhance prosthetic function for amputees. In TMR, the nerve is connected to a functioning motor nerve branch that innervates healthy muscle, while in RPNI, the nerve end is wrapped in a denervated and devascularized muscle graft.^{1,2} Both techniques help prevent nerve pain and neuromas by providing a target for the specific nerve to innervate. For soft tissue management, procedures such as myodesis and myoplasty are often used to improve stability and optimize prosthetic function.³ In myodesis, the muscle groups in the residual limb are fixated to the bone or the periosteum, whereas in myoplasty, antagonist groups are sutured to one other.⁴ A multidisciplinary clinic consisting of surgeons, upper extremity therapists, psychologists, and prosthetists is particularly beneficial in the context of transradial amputations, where maximizing residual limb function is critical. This team-based model allows patients to address prosthetic concerns in real time and ensures that input from the prosthetist is integrated into the surgical plan.

Purpose

In this surgical technique video, we present a transradial amputation with both nerve and soft tissue management. This video provides a comprehensive guide to preoperative evaluation, prosthesis optimization, TMR, RPNI, myodesis, and postoperative rehabilitation—all aimed at minimizing complications such as phantom limb pain and neuroma formation.

Methods

This video explores the anatomy, indications, and treatment options for a 29-year-old male who sustained a severe ballistic injury to the left upper extremity. This resulted in a nonfunctional hand with debilitating nerve pain. The patient developed complex regional pain syndrome which did not resolve with extensive occupational therapy and medication management. Given his disease burden and minimal response to conservative treatment, the patient was recommended for a transradial amputation with TMR.

Results

After a successful amputation with TMR and RPNI, the patient experienced significant relief from nerve pain with occasional painful sensations along the ulnar distribution. The patient began occupational therapy one week after surgery for desensitization, edema reduction, and to maximize elbow function. The patient began prosthetic use six weeks postoperatively.

Conclusion

Transradial amputation with targeted nerve and soft tissue management offers a viable surgical option for patients with severe pain and loss of function who have exhausted conservative treatments. This case highlights the importance of thoughtful preoperative planning, appropriate limb length selection, and the integration of TMR and RPNI to optimize prosthetic use and minimize nerve pain.

References

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